REMARKS/ARGUMENTS

The above amendments and these remarks are in response to the Office action mailed on October 17, 2007. Claims 1, 2, 5, 25, 50, 52, 53 and 55 have been amended. Claims 57 and 58 have been added and are directed to subject matter disclosed in the application as originally filed. No new matter has been added. Claims 1-3, 5-12, 25-39, and 50-58 are now pending in this application. Reconsideration on the basis of the above amendments and remarks below is kindly requested.

The Examiner rejected claims 1-3, 5-12 and 50-54 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. According to the Examiner, claims 1 and 53 claim that the density is selected "in response to the volumes of said substrate and said ultra hard material" and claims 51 and 52 claim that the densities of the two portions are selected "in response to the volume of the substrate and the volume of the ultra hard material." According to the Examiner, the specification does state that sintering-induced stresses is volumetric shrinkage difference compounded by disproportionate substrate and ultra-hard material volumes and discloses reducing sintering-induced stresses by using a substrate that is not fully densified prior to sintering. However, according to the Examiner, the specification does not describe that the density of this substrate is selected in response to the volume of the substrate and the ultra hard material. Furthermore, according to the Examiner, there is no description of the density being selected in response to the volumes of the substrate and ultra hard material or the densities of the two portions of a substrate being selected in response to the volume of the substrate and the volume of the ultra hard material. Applicants respectfully disagree.

The requirements of 35 U.S.C. §112, first paragraph, have been addressed by the Federal Circuit on multiple occasions. The Federal Circuit has stated that "[s]atisfaction of the description requirement insures that subject matter presented in the form of a claim subsequent to the filing date of the application was sufficiently disclosed at the time of filing so that the prima facie date

of the invention can fairly be held to be the filing date of the application." *Eiselstein v. Frank,* 34 U.S.P.Q. 2d 1467, 1470 (Fed. Cir. 2005). According to the Federal Circuit, "[i]n order to determine whether a prior application meets the 'written description' requirement with respect to later-filed claims, the prior application need not describe the claimed subject matter in exactly the same terms as used in the claims; it must simply indicate to persons skilled in the art that as of the earlier date the applicant had invented what is now claimed." *Id.* Furthermore, according to the Federal Circuit "[l]ack of literal support . . . is not enough . . .to support a rejection under §112." *Id.* Moreover, according to the Federal Circuit "[t]he test is whether the disclosure of the application relied upon reasonably conveys to a person skilled in the art that the inventor had possession of the claimed subject matter at the time of the earlier filing date." *Id.* The Federal Circuit has also warned against confining the claims to specific embodiments disclosed in the specification. *Phillips v. AWH Corp.*, 75 U.S.P.Q. 2d 1321, 1323 (Fed. Cir. 2005).

On page 5, lines 15-16 of the application as originally filed, it is stated that

> "[S]intering-induced stresses on the outer surface of the ultra hard material are proportional to the stresses of the interface between the ultra hard material and the substrate."

On page 5, lines 22-25, it is stated that

> "[S]intering stresses are related to the permanent deformations which occur during the consolidation portion of the HPHT process. Applicants have discovered that there is an inverse relationship between sintering-induced stresses and shrinkage of the ultra hard material layer during sintering."

On page 6, lines 9-14 it is stated that

> "[I]n other words, the greater the shrinkage of the PCD, the lower the compressive stresses. Consequently, applicants have discovered that the residual stresses on an ultra hard material of a cutting element may be reduced by reducing the shrinkage constraints on the ultra hard material layer, thus allowing the ultra hard material layer to shrink a greater amount."

On page 6, lines 21 to page 7, line 3 it is stated that

> "[P]art of the driving force for sintering-induced stresses is the volumetric shrinkage difference between the substrate and the ultra-hard material, which is compounded by disproportionate substrate and ultra-hard material volumes. A PCD layer shrinks more than the tungsten carbide substrate during sintering. The present invention provides for a method of making cutting elements with reduced sintering-induced stresses by not fully densifying the substrate, or by using a substrate that is not fully densified, prior to sintering. Applicants have discovered that a substrate that is not fully densified prior to sintering provides a lesser constraint to diamond shrinkage during sintering than a fully densified substrate, thus allowing the ultra hard material layer to shrink more and preventing the further generation of residual stresses due to the constraint." (Emphasis added).

On page 9, lines 7-13 it is stated

> "[I]n an exemplary embodiment of the present invention, the physical constraints placed on the ultra hard material layer by the substrate due to shrinkage during the HPHT process are reduced by controlling the relative shrinkage of the substrate and the ultra hard material layer. In an exemplary embodiment this is achieved by controlling the density of the substrate prior to the HPHT process. As shown in Figures 4a and 4b, altering the density of the substrate material influences the distortion of the interface between the substrate and the ultra-hard layer during sintering."

On page 9, lines 24-26 it is stated

> "[I]t is apparent from these figures that the sintered density of the substrate may be used to minimize or engineer the type of distortion created during the HPHT process."

Finally, on page 10, lines 13-21 it is stated that

> "[T]he thicker, or rather, the more voluminous the ultra-hard material layer, the more impact strength and wear resistance it will have and the more energy it will be able to absorb and the greater chip resistance it will have. However, as the volume of the ultra-hard material layer increases, the residual stresses formed on the interface between the ultra hard material layer and the substrate increase, increasing the risk that the ultra-hard material layer will delaminate from the substrate increases. It is believed that the exemplary embodiment method will allow for the manufacturing of a cutting element having reduced residual stresses at the interface of the ultra hard material layer and the substrate and thus allowing for the incorporation of a thicker ultra hard material layer providing for greater impact strength."

Consequently, the application teaches that by using a partially densified substrate prior to sintering, the sintering-induced stresses on a cutting element are reduced. Reduction in these stresses, according to the application, is achieved by reducing the physical constraints placed on the ultra hard material layer by the substrate during shrinkage during the HPHT process by controlling the relative shrinkage of the substrate and the ultra hard material layer. In fact, the application teaches that the density of the substrate is selected to minimize or engineer the type of distortion created during the HPHT process, which is a function of the sintering-induced process.

The application also teaches that the sintering-induced stresses are driven by the volumetric shrinkage difference between the substrate and the ultra hard material which is compounded by the disproportionate substrate and ultra hard material volumes. In other words, according to the application, the sintering-induced stresses are a function of the relative volumes of the substrate and the ultra hard material layer.

Thus, the application teaches selecting a substrate density for controlling the sintering-induced stresses for minimizing or engineering the type of distortion created during the HPHT process. These sintering-induced stresses, according to the application, are caused by among other things, the relative volumes of the ultra hard material and substrate. As such, the application teaches to one skilled in the art selecting the substrate density based on the relative volumes between the ultra hard material layer and the substrate. Therefore, in accordance with precedence set by the Federal Circuit, the disclosure of the application reasonably conveys to one skilled in the art that the inventor has possession of the claimed subject matter at the time of the filing of the application. Consequently, the application does provide support for claims 1 and 53 as required by 35 U.S.C. §112, first paragraph.

As to claims 51 and 52, the application discloses on page 8, lines 21-24 states that "[A]lthough three exemplary embodiments of combination substrates are shown in Figures 3a to 3c, it should be understood that any suitable combination of single or multiple non-fully, partially and fully densified material regions may be used in the substrate such that a cutting element having suitable residual stress characteristics is formed." Thus, the application also provides support for the densities of various portions of the substrate being selected in response to the volumes of the substrate and the ultra hard material.

The Examiner further rejected claims 1-3, 5-12 and 50-54 under 35 U.S.C. §112, second paragraph. Claims 1, 2, 5, 25, 52 and 53 have been amended to overcome this rejection.

The Examiner rejected claims 25-33, 37-39, 55 and 56 under 35 U.S.C. §103(a) as being obvious over Eyre et al., U.S. Patent No. 6,193,001. Claim 25 requires a method of manufacturing a cutting element comprising selecting an ultra hard diamond material which is not fully densified and "selecting a substrate which has been exposed to a thermal condition for producing partial densification, whereby such substrate has a first portion that has a first density less than 100% of full density due to said exposure, and a second portion that has a second density that is different from the first density . . . ". Eyre et al. appears to disclose a substrate 20 which appears to be fully densified and a sheet, such as sheet 34 of transition material which is not fully densified and which has not been exposed to a thermal condition for having partial densification. The sheet 34 appears to be formed from tungsten carbide particles and a binder. Eyre et al. does not appear to disclose a substrate which has a portion that has a density less than 100% which is formed by subjecting the substrate to a thermal condition as required by claim 25. Claims 26-33 and 37-39 are dependent from claim 25. As such, Applicants submit that these claims are also not rendered obvious by Eyre et al. for the same reasons as claim 25 and for the additional limitations that these claims contain therein.

Claim 55 is directed to a method of manufacturing a cutting element which includes "selecting an ultra hard diamond material solid; selecting a substrate which has been exposed to a thermal condition for producing partial densification of said substrate, whereby at least a portion of said substrate has a density that is less than 100% of full density of said at least a portion due to said exposure to said thermal condition; . . .and sintering the resulting assembly of the substrate and ultra-hard material solid . . . ". Eyre et al. appears to disclose providing an embossed sheet of ultra hard material, but not an ultra hard material solid as required by claim 55. Furthermore as discussed in relation to claim 25, Eyre et al. does not appear to disclose a substrate that is partially densified by being exposed to a thermal condition. As such, Applicants submit that claim 55 is not rendered obvious by Eyre et al. for either of the aforementioned reasons. Claim 56 is dependent from claim 55. As such, Applicants submit that for either of the aforementioned reasons, claim 56 is also not rendered obvious by Eyre et al. for the same reasons as claim 55 and for the additional limitations it contains therein.

The Examiner rejected claims 25-33, 37, 38, 55 and 56 as being obvious over JP 53-134804 ("JP '804"). All the rejected claims are directed to a method of manufacturing a cutting element and require selecting an ultra hard diamond material. JP '804 does not disclose use of a diamond material, but rather discloses use of a cubic boron nitride ("CBN") material. Consequently, JP '804 cannot render claims 25-33, 37, 38, 55 and 56 obvious. Furthermore, claim 25 requires that the densities of two portions of the substrate are selected for providing a desired level of constraint by the substrate to the ultra hard material shrinkage during sintering. This feature also does not appear to be disclosed by JP '804. Moreover, some of the claims require other features specifically not disclosed by JP '804. For example, claim 29, which is dependent from claim 25, requires that the first density of the substrate is in the range of about 40% to about 70% of full density. Claim 55 requires that the density of the substrate be selected for providing a desired level of constraint by the substrate to the ultra hard material layer solid during sintering. These features also do not appear to be disclosed by JP '804. Moreover, the shrinkage of CBN relative to a substrate such as a tungsten carbide substrate during an HPHT sintering process is not as

significant as the shrinkage of diamond material relative to the same type of substrate during an HPHT sintering process so as to warrant control of the constraint provided by the substrate to the CBN. Thus, JP '804 which discloses a compact having a CBN layer does not disclose, teach or suggest selecting the density of the substrate for providing a desired level of constraint on a diamond material. Thus, Applicants submit that JP '804 does not render these claims obvious for these additional reasons.

The rejections and objections to all claims pending in this application are believed to have been overcome and this application is now believed to be in condition for allowance. Should the Examiner have any remaining questions or concerns about the allowability of this application, the Examiner is kindly requested to call the undersigned attorney to discuss them.

Respectfully submitted,
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